

REMARKS/ARGUMENTS

Claims 29-45 remain pending. No claims are amended or canceled by this response.

Embodiments in accordance with the present invention relate to methods of finishing silicon on insulator (SOI) substrates/wafers, and in particular to methods in which an etching treatment is performed on a cleaved surface. Accordingly, pending independent claims 29 and 41 recite:

29. A dry method for finishing SOI substrates, said method comprising:
providing an SOI substrate comprising a cleaved surface, said cleaved surface having a first surface roughness value;
performing a hydrogen treatment to increase a concentration of hydrogen of said cleaved surface; and
performing an etchant and thermal treatment after the hydrogen treatment .
... (Emphasis added)

42. A dry method for finishing SOI wafers, said method comprising:
providing an SOI wafer comprising a main surface that has been cleaved, said cleaved main surface having a first surface roughness value;
performing a hydrogen treatment to increase a hydrogen concentration of said cleaved main surface; and
performing an etchant and thermal treatment after the hydrogen treatment .
... (Emphasis added)

The pending claims have been rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent 6,251,754 to Ohshima et al. ("the Ohshima patent"), taken in combination with U.S. Patent 5,141,878 to Benton et al. ("the Benton patent"). Certain pending claims stand rejected as obvious based upon the Ohshima and Benton patents further in combination with other references. These claim rejections are overcome as follows.

As a threshold matter, the Examiner is reminded that in order to establish a prima facie case of obviousness, "the prior art reference (or references when combined) must teach or suggest all the claim limitations." MPEP 2142.

Here, while the Ohshima patent does describe treating a detached surface of a SOI substrate, there is absolutely no teaching or even suggestion in the Ohshima patent regarding performing an etchant treatment.

In a first example given by Ohshima patent, a detached surface of a SOI substrate is subjected to high-temperature annealing at 800°C or above. No mention is made of any particular gases being present during this annealing, never mind performance of etching. (See col. 9, lines 45-50). In a second example of the Ohshima patent, a detached surface of a SOI substrate is generically referred to as being subjected to "high temperature annealing", with no further elaboration on process conditions. (See col. 9, lines 45-50). In a third example given by the Ohshima patent, there is no mention of annealing a detached surface at all. (See col. 14, lines 39-44). In a fourth example given by the Ohshima patent, a detached surface is described as being exposed to heat treatment at a temperature higher than that employed to segregate layers to form the SOI substrate. Apart from employing an increased temperature, there is otherwise no discussion of the conditions of this heat treatment, and certainly no mention of etching. (See col. 17, lines 41-44). The fifth, sixth, and seventh examples also described in the Ohshima patent similarly fail to provide any teaching, or even suggestion, regarding performance of an etching treatment.

In an effort to provide such a teaching, The Examiner has combined the Ohshima patent with the Benton patent. However, the Examiner is reminded of a second key requirement for establishing a prima facie case of obviousness:

there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. (MPEP 2143).

The teaching or suggestion to make the claimed combination must be found in the prior art, not in applicant's disclosure. In re Vaeck, 947 F.2d 488 (Fed.Cir. 1991).

Here there is no absolutely suggestion, either in the references themselves or in knowledge generally available, that would motivate one of ordinary skill in the art to look to combine the Benton patent with the Ohshima patent.

The Benton patent relates to fabricating a photodiode structure in a conventional single crystal substrate. There is no teaching or even suggestion in the Benton patent, regarding processing a SOI substrate in the manner of the Ohshima patent.

Moreover, while the Benton patent does describe exposing a surface to etching conditions, that surface is not the detached SOI surface of the Ohshima patent. Rather, in the

Benton patent, side walls and a bottom of a tub already-etched into a single crystal substrate, are exposed to etching conditions:

the entrenched wafers can be subjected to a combined high temperature pre-bake and HCl-H₂ gas etch to reduce native oxide films and to further smooth the bottom and side walls of the tub. A five minute pre-bake and etch at 1025°C. using 0.9 l/m of HCl and 40 l/m of H₂ is exemplary. (Col. 2, lines 48-53)

This excerpt comprises the entire disclosure of the Benton patent regarding treatment of a substrate surface under etching conditions. The Benton patent includes no information that could reasonably lead one of ordinary skill in the art to perform such etching treatment upon the detached surface of the SOI substrate of the Ohshima patent. For example, the Benton patent provides no ranges, or even numerical values, for changes in surface roughness of tub side walls or bottom surfaces achieved utilizing HCl-H₂ exposure. In view of the Benton patent's omission of such information, it is difficult to understand how one of ordinary skill in the art would reasonably have been motivated to look to the Benton patent for its combination with the Ohshima patent.

Of course, the instant application is replete with explicit suggestion regarding performing etching treatment to a cleaved surface of an SOI substrate. However, the Examiner is strongly cautioned against relying upon Applicants' own disclosure to provide any motivation to combine references:

[t]he tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art. (Emphasis added; MPEP 2142).

This strict prohibition against the use of hindsight, coupled with the lack of any apparent motivation in the Benton patent for its combination with the Ohshima patent, renders improper any conclusion of obviousness conclusion based upon these references.

Finally, it is noted that other references relied upon by the Examiner to reject pending claims, fail to teach or suggest performing an etchant treatment in the manner of the pending claims. For example, both the articles to Moriceau et al. and Tate et al. disclose annealing a surface in the presence of hydrogen, a step which corresponds to the "hydrogen treatment" step

recited by the pending claims. These references fail to teach, or even suggest, the "etching treatment" step of the claimed embodiments.

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke extending to the right.

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